the credible market share data shows that competitive entry has been minimal.

BA-PA also argues that the complaints are exaggerated, that some of the problems are caused by the CLECs themselves, that BA-PA is solving many of the problems, and that OSS is largely irrelevant to service provided by facilities based CLECs to large volume customers. (BA-PA R.B. at 33-43). Considering that I recommend denial of this petition for other reasons, it is unnecessary to discuss each of these points in detail, but it may be useful to discuss some points to provide guidance for the future.

While the CLECs are undoubtedly responsible for some of the problems that have arisen, it appears to be the case that BA-PA is dragging its feet in this area. It has been two and one-half years since the passage of the Act, and five years since the passage of Chapter 30. I have heard complaints from CLECs about these problems during several cases over the past two years. At this late date, it is unacceptable for BA-PA to provide the CLECs' programmers with inaccurate or insufficient information of the kind that they need to construct the CLEC side of electronic interfaces that they share with BA-PA. (MCI St. 4 at 25-26). It is equally unacceptable for BA-PA to make substantial changes to its electronic interfaces just as the CLECs are preparing to use them. (MCI St. 4.0 at 25-26). These kinds of problems suggest that BA-PA is making somewhat less than its best effort to meet this critical need. While developing these interfaces is undoubtedly a major task, it has been several years now.

Similarly, while it is true that OSS is less important for service provided by a facilities based CLEC to large volume customers, it is also true that certain forms of OSS are necessary even for these customers. Obviously of prime importance is that CLEC customers be included in the phone book. As described in CTSI's brief at page 7, BA-PA has omitted CLEC customers from phone directories published in February 1998 for Wyoming Valley and in May 1998 for Harrisburg. While it is possible to accept the first omission as an understandable mistake, it stretches one's credulity to think that a second mistake of this serious nature several months after the first was purely coincidental.

Lastly, it seems no coincidence that BA-PA is most responsive to these problems when it is asking for Commission approval of a petition like this one, or its request to enter the interLATA toll market. (CTSI Brief at 6).

It is obvious that the CLECs have an incentive (their desire to enter the market) to fix these problems, while BA-PA has an incentive (retention of its enormous market share) to drag its feet. It seems that the Commission must establish, monitor, and enforce specific performance standards in this area for BA-PA. Independent monitoring of these processes is necessary to sort out the charges and counter-charges between BA-PA and the CLECs. Permanent monitoring is needed to ensure that these problems, once solved, do not reoccur after BA-PA has been allowed into the interLATA market, and once all markets have been declared competitive.

VIII. Ability Of Competitors To Offer Services At Competitive Prices, Terms And Conditions.

This is another finding where empirical evidence (five years after the passage of Chapter 30 of the Public Utility Code, BA-PA retains over 90% of the business local telecommunications market in its service territory) directs an obvious answer. If competitors were able to offer all business services or other similar activities throughout BA-PA's service territory, one would expect that they would be doing so now. That clearly is not the case today.

IX. The Availability Of Like Or Substitute Services Or Other Activities In The Relevant Geographic Area.

This issue has been covered at pages 12-14 and 33, and further elaboration is unnecessary.

X. Coin Telephone and Internet Service Providers.

The coin telephone providers (CAPA) and the Internet service providers (ISP) differ from the CLEC parties in that they are both purchasers of retail service from BA-PA and competitors of BA-PA or a BA-PA affiliate. Because I am recommending denial of BA-PA's petition, it is unnecessary to address their specific claims.

XI. The Imputation Standard.

BA-PA proposes to meet the imputation test of Chapter 30 by aggregating the revenues for all of these services. That is, a proposed rate for a deregulated BA-PA business service would pass the imputation test as long as the revenues for all

business services exceed the revenues that BA-PA would realize from the sale of the associated basic service functions to its competitors. Thus, BA-PA would be free to offer some services at below cost as long as others were priced above cost. According to BA-PA, even a price of zero on a specific service would not flunk this test. (Tr. 339).

This is similar to the proposal that BA-PA made in its Petition Of Bell Atlantic - Pennsylvania, Inc. For A Determination Of Whether IntraLATA Toll Service Is Competitive Under Chapter 30 of the Public Utility Code, Docket No. Docket No. P-00971293. My rulings here, if necessary, would be similar to, but not identical to, my rulings in my recommended decision signed March 30, 1998, in that case. In particular, I conclude that Commission precedent precludes the broad interpretation of the imputation test urged by BA-PA. In an order permitting several Bell toll calling plans to go into effect, the Commission required each of those plans to comply with an imputation safeguard. AT&T Communications of Pennsylvania, Inc., et al. v. Bell Atlantic- Pennsylvania, Inc., Docket Nos. R-00953394C002-0004, R-00953396C0002-0004, R-00953409C0001&C0004, entered July 9, 1997, at 12, 16 and 19. Also, in the Investigation to Establish Standards and Safeguards for Competitive Services, Docket No. M-00940587 (Order entered August 6, 1996), the Commission required BA-PA to perform an imputation analysis for its Centrex Extend service, despite BA-PA's claim that Centrex Extend is a "feature" and not a service. Competitive Safeguards, at 42.

Although I conclude that Commission precedent favors the interpretation urged by AT&T, MCI and OTS, I am not unsympathetic to BA-PA's view of this issue. In a fully competitive market, it would have, and would need, the freedom to price as it saw fit. I do not agree with BA-PA, however, that we are yet at that point. Given the fact that facilities based competition for BLES is non-existent in much of BA-PA's territory, adoption of BA-PA's imputation test would be an invitation to BA-PA to raise prices in areas without facilities based competition, while lowering prices in areas where it faced such competition. Again, this might not be a bad thing, if it attracted facilities based competitors to the areas where BA-PA had raised rates; however, facilities based competitors need collocation space which is not now available in two-thirds of BA-PA's wire centers.

XII. Partial Relief.

At the outset of this case, BA-PA took an all-or-nothing approach to its request for competitive designation of all business telecommunications service throughout its entire service territory. BA-PA now asks for the following partial relief in the event that the petition is not granted in full:

> *Second,* even if the record did not support competitive classification of BA-PA's business telecommunications service for *all* business customers, which it does, it is undisputed that customers generating (conservatively) $10,000 in annual BA-PA total billed revenues have competitive alternatives via dedicated access arrangements such as AT&T's Digital Link service *throughout BA-PA's service territory.* Competitors do not need BA-PA's UNEs or its OSS to reach these customers. If the Commission declines to grant BA-PA's petition in its entirety, nothing prevents it from

> classifying as competitive telecommunications service the services provided by BA-PA to the obviously competitive segment of the business market of customers spending or committing to spend $10,000 in annual BA-PA telecommunications revenue.[1]

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[1] The fact that BA-PA has not presented imputation results for this customer segment has no bearing on the Commission's ability to declare business telecommunications service competitive for these customers. Imputation is a forward-looking requirement, not, as the Supreme Court has recently confirmed, a precondition to competitive classification. *Popowsky v. Pennsylvania Pub. Util. Comm'n*, 706 A.2d 1197 (1997). The imputation methodology presented by BA-PA complies with the statute and would be applied to any service declared competitive by the Commission.

(BA-PA R.B. at 2). The other parties oppose BA-PA's request for partial relief on various grounds.

A full reading of the record suggests that large volume customers, particularly in the urban areas of Philadelphia and Pittsburgh, have competitive alternatives to BA-PA. This is not surprising since these areas are where facilities based carriers such as TCG have located fiber rings and switches. (TCG St. 1 at 5). This is not surprising for another reason: it is much easier and more profitable for a CLEC to serve a customer large enough to utilize one or more high capacity lines because the CLEC does not need UNE loops from BA-PA. If a CLEC does not need UNE loops from BA-PA, this lessens (but does not eliminate) the reliance of the CLEC on BA-PA's OSS, which is one less barrier to serving the customer. (The CLEC still needs to get the customer listed in the local BA-PA phone directory; not always a trivial task, as previously discussed.) On balance, effective local phone

competition seems to be much more of a reality for large customers.

The record, unfortunately, contains too little evidence to determine with any degree of confidence the type or size of customer for which competitive designation would be prudent. In its reply brief BA-PA has suggested a break-point of $10,000 in local revenue, because it calculates that AT&T offers its Digital Link service to customers who generate that little local revenue. (BA-PA R.B. at 2). Equally plausible demarcation points might be $40,000 in revenue or 24 voice grade lines (corresponding to a single T-1 high capacity line). (Tr. 390-391, 1453-1454). The problem is that the record is insufficiently developed to make a decision on this issue. (I would not necessarily accept BA-PA's proposal based loosely on AT&T's Digital Link service because that service requires a customer to have a PBX, or Centrex service.) The record is also unclear as to the extent to which these services are actually available outside of the major metropolitan areas. Because it was BA-PA's duty to develop the record on these issues, I have no choice but to recommend denial of its request for partial relief. Frankly, had BA-PA originally presented a proposal limited to competitive designation for service to large customers, it might have been possible to try the case within a 180 day schedule, with at least a reasonable prospect for success. As it is, I cannot determine on this record where to draw the line, or what conditions to impose for partial relief.

CONCLUSION

For the reasons set forth above, I recommend that the Commission dismiss this petition.

RECOMMENDED ORDER

THEREFORE, IT IS ORDERED (subject to Commission approval):

That the Petition of Bell Atlantic - Pennsylvania, Inc. for a determination of whether the Provision of Business Telecommunications Services Is Competitive Under Chapter 30 of the Public Utility Code at Docket No. P-00971307 is denied and dismissed.

Date: July 14, 1998

Michael C. Schnierle
Administrative Law Judge

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	CC Docket No. 98-121
Application of BellSouth Corporation,	)	
BellSouth Telecommunications, Inc.	)	
and BellSouth Long Distance, Inc.	)	
for Provision of In-Region, InterLATA	)	
Services in Louisiana	)	

Exhibit P:
Bowman Rebuttal Testimony on Behalf of BellSouth,
South Carolina PSC Docket No. 97-239-C (Mar. 2, 1998)

REBUTTAL TESTIMONY OF DR. ROBERT M. BOWMAN
ON BEHALF OF BELLSOUTH TELECOMMUNICATIONS, INC.
AND UNITED TELEPHONE COMPANY OF THE CAROLINAS
BEFORE THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA
DOCKET NO. 97-239-C
MARCH 2, 1998

Q. PLEASE STATE YOUR NAME, OCCUPATION, AND ADDRESS.

A. My name is Robert M. Bowman. I am an independent telecommunications consultant. My address is 10655 West Rowland Avenue, Littleton, Colorado, 80127.

Q. ARE YOU THE SAME DR. ROBERT M. BOWMAN WHO FILED DIRECT TESTIMONY ON FEBRUARY 17, 1998?

A. Yes. Attachment RMB-1 to my direct testimony, filed on February 17, 1998, provides a description of my experience and training relevant to this proceeding.

Q. WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY?

A. I am testifying on behalf of BellSouth Telecommunications, Inc. ("BellSouth") and United Telephone Company of the Carolinas ("United"), and my rebuttal testimony addresses the Hatfield Model, Release 5.0a (HM 5.0a). In particular, I respond to the direct testimonies of Mr. Don. J. Wood and Mr. James W. Wells Jr., regarding the engineering aspects of HM 5.0a.

Q. MR. WOOD IMPLIES, E.G., AT PAGES 7-8 OF HIS DIRECT TESTIMONY, THAT HM 5.0a IS EASY TO USE AND THAT THE MODEL INPUTS CAN BE READILY ALTERED. DO YOU AGREE?

A. No. Some of the assumptions in HM 5.0a are not obvious and are not user-adjustable. For example, HM 5.0a does not place telephone poles as part of the aerial structure in the two highest density zones; in essence, it assumes that

telephone poles are not required in this density zone. This assumption is not obvious to the user, however. Furthermore, there is no user-adjustable input that allows the user to provide for the placement of poles as part of the aerial structure in the two highest density zones. The user must not only search through the Excel formulas to be certain of how structure is treated, but must modify the Excel formulas to incorporate a more realistic assumption.

Q. WOULD YOU PLEASE EXPLAIN WHY THE EXCLUSION OF POLES IN THESE DENSITY ZONES IS NOT OBVIOUS TO THE USER?

A. Yes. The Hatfield Model, Release 5.0a, Model Description states that in more urban areas, aerial distribution cable "may" be attached directly to the outside of buildings or, for high-rise buildings, "may" consist of riser cable inside of buildings. Also, HM 5.0a Model Description states at section 6.2.1 that "most" aerial structure in the two highest density zones is assumed to be intrabuilding "riser" cable and "block" cable attached to buildings. In another instance, HM 5.0a Inputs Portfolio states in section 2.5 that aerial structure in these zones "is also assumed to consist of 'riser and block cable'". The Hatfield Inputs Portfolio states at section 2.5.1 that "...existing joint use pole lines are also more prevalent in older, more dense neighborhoods built prior to 1980." And finally, the electronic version of the distribution inputs table in the two highest density zones has pole spacing footages associated with them.

All of these statements lead the user to assume that poles are placed in the two highest density zones. As stated above, however, the user must delve into the Excel formulas in the Model itself in order to determine that no poles are placed in these density zones.

Q. IS THE EXCLUSION OF POLES IN THE HIGH DENSITY ZONES AN IMPORTANT OMISSION?

A. Yes. HM 5.0a assumes as much as 60% to 85% of loop plant is aerial in its two highest density zones. With no poles, there is no aerial structure cost per se, just the material cost of the cables. Eliminating pole costs results in an understatement of structure cost in the high-density zones, especially since HM 5.0a assumes such a high percentage of aerial plant. Block cable is aerial cable attached to the sides of buildings. Owners typically do not permit unsightly attachments to the sides of their buildings, and like other forms of aerial structure, block cable is exposed to the weather, electric power and lightning.

Q. CAN YOU PROVIDE ANOTHER EXAMPLE OF AN HM 5.0a ASSUMPTION THAT IS DIFFICULT FOR THE USER TO IDENTIFY OR CHANGE?

A. Yes. HM 5.0a does not include manholes and handholes in the distribution plant. This feature of HM 5.0a's engineering parameters is not clearly revealed in the Model's documentation. The Model does not have user-adjustable input tables that permit a user to easily add such items of structure to the distribution plant. For this reason, unless a user is capable of altering the Model's computer programming, the Model "automatically" substantially understates underground conduit costs in distribution plant.

Implicitly, HM 5.0a assumes that distribution manholes and handholes are not required. Thus, HM 5.0a imposes this unrealistic assumption on unsuspecting users. In fact, the larger cable sizes needed in dense urban areas are often too big to sweep up from beneath the ground and attach to pedestals or poles on the surface. Manholes, and handholes are frequently required to build distribution plant in urban areas. Omitting them entirely from HM 5.0a fails to recognize requisite costs incurred to serve urban subscribers.

Q. WHAT IS THE EFFECT OF HM 5.0a NOT INCLUDING MANHOLES AND HANDHOLES IN DISTRIBUTION PLANT?

A. Omission of this distribution plant understates the costs actually incurred in providing basic local exchange service. The omission is likely to remain undetected by the unsuspecting user. Moreover, even if the user discovers the undocumented or missing input values, the Model is difficult to modify to include missing distribution plant.

Q. DOES MR. WELLS DISCUSS STANDARD DESIGN PRACTICES IN HIS DIRECT TESTIMONY?

A. Yes. At pages 4 and 5, Mr. Wells suggests that HM 5.0a relies on design assumptions that are similar to standard design practices.

Q. DOES MR. WELLS CITE ANY ENGINEERING STANDARDS OR PRACTICES TO SUPPORT HIS CLAIM?

A. No. Mr. Wells does not cite any engineering standards or practices to substantiate his claim. The Hatfield "Engineering Team" Mr. Wells discusses in his direct testimony appears to have made up their own guidelines rather than relying on industry standards.

Q. DOES HM 5.0a ADEQUATELY REFLECT ENGINEERING DESIGN RULES WITH RESPECT TO ITS MODELING OF THE LOOP NETWORK?

A. No, it does not. HM 5.0a does not adequately reflect engineering guidelines and practices published by Bellcore and AT&T, such as AT&T's "Outside Plant Engineering Handbook, August 1994," reprinted under the Lucent label in 1996. This reference is attached to my rebuttal testimony as RMB-1. Similar criteria are contained in the "Loop Technology Planning Guidelines" from Bellcore (BR 916-100-017).

HM 5.0a violates these limits by extending copper loops beyond the digital loop carrier (DLC) remote terminal (RT) up to 18,000 feet without additional

provisions. such as extended range channel units. Therefore. the local loop design in HM 5.0a is not capable of providing adequate quality telephone service.

Q. WILL YOU ELABORATE ON WHY THE LOCAL LOOP DESIGN IN HM 5.0a IS NOT CAPABLE OF PROVIDING ADEQUATE QUALITY TELEPHONE SERVICE?

A. Certainly. The line loss standard for good quality telephone service should not exceed 8.5 decibels (dB) of loss for the entire line. HM 5.0a places standard channel unit cards (plug-ins) in its Digital Loop Carrier (DLC). Each standard channel unit card inherently has 2 dB of loss. This permits a maximum of 6.5 dB of loss for the loop. Decibel loss, per 1,000 feet, for underground or buried cable at standard temperatures, i.e., 68 degrees, is 0.54 dB for 26 gauge cable and 0.44 dB for 24-gauge cable. Even with the conservative assumption that all cable is 24 gauge buried cable (aerial cable in the mix increases the loss), the dB loss for just the metallic loop on an 18,000 foot copper cable is approximately 8 dB. An additional 2 dB of loss inherent in the standard channel unit card brings the total dB loss to approximately 10 dB. Still further dB losses will occur if the line is aerial rather than buried or underground. Consider this additional loss to equal 0.5 dB, bringing the total loss to 10.5 dB. These calculations are shown in my attachment RMB-2.

Therefore, the HM 5.0a 18,000 foot copper loop has approximately 2 dB more loss than the maximum loss allowed for good quality telephone service. Because dB is measured on a logarithmic scale, this additional loss is significant. Good quality telephone service provides approximately 60% more power over the line than the HM 5.0a 18.000 foot line provides. Customers would have to yell into the telephone in order to be heard.

Q. WHAT ARE THE MAXIMUM LOOP LENGTHS THAT ALLOW GOOD QUALITY TELEPHONE SERVICE?

A. My attachment RMB-2 also shows the calculations of the maximum loop lengths of 11,100 feet (for 26 gauge cable) and 13,600 feet (for 24 gauge cable) that allow good quality telephone service. BCPM 3.1, in contrast to HM 5.0a, reflects engineering standards by using larger 24 gauge cable beyond 11,100 feet and replacing standard channel unit cards with extended range line cards beyond 13,600 feet.

Q. IS THERE A PROBLEM WITH HM 5.0a'S USE OF THE STANDARD CHANNEL UNIT CARDS ON COPPER LOOPS THAT EXTEND 18,000 FEET BEYOND THE DLC?

A. Yes, there is a significant problem. The standard channel unit cards used by HM 5.0a cannot reach copper loops that extend 18,000 feet from the DLC to the customer. In other words, HM 5.0a models copper distances not supported by the technology assumed. HM 5.0a and BCPM 3.1 both assume the use of the Litespan 2000 (manufactured by DSC). DSC's documentation, however, states that the practical limit of the system is 1,000 ohms, and another vendor (American Fiber Corporation, AFC) suggests that at maximum DC supervision, range transmission loss due to cable length may be greater than 8 dB. In another section of DSC's vendor documentation, it clearly states that the loop design for the standard channel unit card is based on Carrier Serving Areas rules, which, as pointed out above, limit loops to much shorter than 18,000 feet. Exhibit RMB-3 contains excerpts from the "DSC Practice Litespan Engineering and Planning" guidelines that describe limitations on loop lengths and the need for extended range line cards for loops beyond 12,000 feet. ("DSC Practice Litespan Engineering and Planning," OSP 363-205-010, Issue 6, July 1997, System Level Planning, Section 5.3 – CSA Transport Planning.)

Q. DOES HM 5.0a MEET THE CRITERIA ESTABLISHED BY CONGRESS AND THE FCC REGARDING THE PROVISION OF ADVANCED SERVICES?

No. it does not. HM 5.0a does not even meet the criteria for the provision of plain old telephone service (POTS) and modem/fax connections, as discussed above, much less criteria for other advanced services. In addition, HM 5.0a attempts to identify the cheapest technology to use without any regard for the types of services offered now or in the future. HM 5.0a purports to evaluate the costs of choosing fiber versus copper as a transport medium. If copper is the cheapest, HM 5.0a selects it as the medium of choice.

Two of the principles for universal service established in the Telecommunications Act of 1996 are relevant here. First, that: "access to advanced telecommunications and information services should be provided in all regions of the Nation." And second, that services in rural areas be comparable to those in urban areas. In addition, the FCC stated in their November 13, 1997, Public Notice (DA 97-2372) that the definition of supported services should "advance with technology."

HM 5.0a does not satisfy the universal principles established by Congress and rather than advancing with technology, HM 5.0a incorporates unrealistically long copper loops and 1960s technology with its choice of copper over fiber

Q. THE HATFIELD DOCUMENTAION STATES THAT HM 5.0a ESTABLISHES AN 18,000 FOOT MAXIMUM COPPER LOOP LENGTH. DOES HM 5.0a ACTUALLY CONSTRAIN COPPER LOOP LENGTHS TO 18,000 FEET?

A. No, it appears that HM 5.0a places copper loop lengths greater than 18,000 feet in two types of circumstances. First, as I noted above, HM 5.0a uses copper T1 carrier to serve outlier clusters that are more than 18,000 feet from the DLC site.

Second, and more importantly, many of HM 5.0a clusters are so large that it would require more than 18,000 feet of copper distribution facilities to serve customers in the cluster. For example, with a HM 5.0a rectangular cluster that is

six miles by two miles in dimension. HM 5.0a implies copper distribution facilities of nearly 4 miles in length or nearly 21,120 feet in length. This is one half of the sum of the length and width of the rectangular cluster. This is the distance required to reach from the centroid of the rectangle to any one of the corners of the rectangle. Although HM 5.0a requires a slightly smaller copper distribution distance since facilities need only travel to the housing unit of the last lot, for ease of discussion, this difference is assumed to be negligible. Therefore, such a cluster requires copper distribution distances greater than the 18,000 foot maximum claimed by HM 5.0a sponsors.

Q. DO SUCH CLUSTERS EXIST IN SOUTH CAROLINA?

A. Yes. There are over 23% of the HM 5.0a clusters in which the length + width of the cluster is more than 36,000 feet, which would require a loop path in excess of 18,000 feet to reach from the centroid to the corner of the cluster. These clusters account for over 51% of the total main cluster areas existing for the state in HM 5.0a.

Such a large number of clusters, accounting for such a large proportion of the area modeled by HM 5.0a, illustrates the models propensity to violate its own stated restriction of copper distribution distances no greater than 18,000 feet.

Q. PLEASE SUMMARIZE YOUR REBUTTAL TESTIMONY.

A. My rebuttal testimony focuses on HM 5.0a outside plant design from an engineering perspective. I address two significant issues. First, contrary to the claims of Mr. Wood, many of the important assumptions within HM 5.0a are not included in the user-adjustable inputs, and these assumptions are not obvious to the user. Second, contrary to the testimony of Mr. Wells, HM 5.0a continues to violate engineering design rules for outside plant. This results in a network design that uses outdated technology and provides such poor service quality that some customers would have to yell into the telephone in order to be heard.

Consequently, HM 5.0a fails to satisfy fundamental requirements of the Telecommunications Act of 1996 regarding access to advanced services and providing services to rural areas that are comparable to those provided in urban areas.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Application of BellSouth Corporation,	)	CC Docket No. 98-121
BellSouth Telecommunications, Inc.	)	
and BellSouth Long Distance, Inc.	)	
for Provision of In-Region, InterLATA	)	
Services in Louisiana	)	

Exhibit Q:
Bowman Testimony on Behalf of BellSouth,
South Carolina PSC Docket No. 97-239-C (Feb. 17, 1998)

DIRECT TESTIMONY
OF DR. ROBERT M. BOWMAN
ON BEHALF OF BELLSOUTH TELECOMMUNICATIONS, INC.
AND UNITED TELEPHONE COMPANY OF THE CAROLINAS
BEFORE THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA
DOCKET NO. 97-239-C
FEBRUARY 17, 1998

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME, ADDRESS, AND BUSINESS AFFILIATION.

A. My name is Robert M. Bowman. My address is 10655 West Rowland Avenue, Littleton, Colorado, 80127. I am an independent telecommunications consultant.

Q. PLEASE DESCRIBE YOUR WORK EXPERIENCE AND EDUCATIONAL BACKGROUND.

A. My work experience includes testifying in many proceedings involving incremental costs over the past eighteen years, primarily as an employee of U S WEST Communications. Exhibit RMB-1 describes my background and experience in detail.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. I am testifying on behalf of BellSouth Telecommunications, Inc. ("BellSouth") and United Telephone Company of the Carolinas ("United"). My testimony, along with Dr. Kevin Duffy-Deno's, is filed in lieu of Dr. Richard D. Emmerson's, which explained the Benchmark Cost Proxy Model (BCPM). My testimony explains, from an engineering perspective, why the BCPM, Version 3.1 ("BCPM 3.1"), is the appropriate model for the Public Service Commission of South Carolina ("Commission") to rely upon in estimating the costs of universal service for BellSouth's and United's territory in South Carolina. I discuss how

products. As such, a network designed to different specifications would require non-standard equipment which would cost substantially more. Indeed, the ubiquity of the CSA standard and the scale of manufacturing capacity that this has created has significantly driven down the cost of DLC equipment, making it the most efficient vehicle for providing basic telephone service with access capability to advanced services.

V WHAT IS REQUIRED TO PROVIDE ACCEPTABLE VOICE GRADE SERVICE AND 28.8 Kbps FUNCTIONALITY?

In December of 1996, Bellcore published a Technical Memorandum (TM-25704) which provided a methodology for estimating the maximum modem speed that can be maintained by a V.34 depending on various factors of the circuit over which the modem transmission occurs. The results of their analysis are summarized in Figure I, below, a full copy of the Technical Memorandum appears at the end of this section.

Figure I - Predicted Modem Speeds

				POINTS
1. **CUSTOMER LOOP** (each end)				
0 - 9 Kft NL = 0	9 - 12 Kft NL = 1	12 - 15 Kft NL = 3		
15 - 24 Kft L = 7	24 - 30 Kft L = 10	> 30 Kft L = 12		
2. **LOOP CARRIER** (each end)				
No DLC = 0	IDLC = 2	UDLC = 6		
3. **SWITCH TYPE** (each end)				
Analog = 0	Digital = 1			
4. **INTEROFFICE**				
Digital Route = 2	Analog Tandem = 4	B/B - Cxr = 6		

SCORING:			
0 - 6 = 28.8 Kbps	7 - 9 = 26.4 Kbps	10 - 13 = 24.0 Kbps	14 - 16 = 21.6 Kbps
17 - 20 = 19.2 Kbps	21 - 25 = 16.8 Kbps	26 - 30 = 9.6 Kbps	

As can be seen, there are seven factors which determine the maximum speed which can be achieved - the loop on both ends of the circuit, the presence of Digital Loop Carrier on the two loops, the type of switch on either end of the circuit, and the type of circuit connecting the two central offices. Depending on the characteristics of each of these seven components, points are awarded. The number of points for the total circuit determines the maximum modem speed which can be maintained.

The relevance of this chart can be seen in the line relating to the customer loop. Loops under 9 Kft receive no points, loops from 9 to 12 Kft receive 1 point, while loops from 12 to 18 Kft receive 3 points. Since anything over six points prevents the achievement of the 28.8 Kbps speed, a design standard which routinely utilizes loops over 12 Kft can use up the full point allotment on the loop alone, even without consideration of the digital loop carrier (which will be utilized for most, if not all, rural customers), the central office switches and the interoffice transmission facility.

By utilizing the DSC architecture and the maximum 12 Kft copper loop, BCPM3 assures that the requirements for advanced telecommunications service access for remote rural customers is reasonably comparable to that enjoyed by urban customers, as mandated in the 1996 Act.

Bellcore

Memorandum Abstract

Memorandum Number (NM or TM)	Title
TM-25704	Guidelines for High Speed Analog Data Transmission in the Switched Netwo
Memorandum Correlation Date	
December 1996	

Software/Product Name	Release No

Project No	WP/Task	Project No	WP/Task	Project No.	WP/Task	Project No.	WP/Task	Project No	WP/Task
422241	01	SW3650	01	SW3651	01	6A3624	01		

Author(s)/SME(s)	Org. Code(s)	Loc. Code & Room No.(s)	Tel No.(s)
Ricardo J. Perez	331H0	MCC 1F131G	201-829-2960

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_ Bell Atlantic _ Pacific Bell _ SNET
_ _ Southwestern Bell _ CBI _____
_ Bellcore

Entitled Companies

_ Ameritech _ NYNEX _ U S West _ Other
_ Bell Atlantic _ Pacific Bell _ SNET
_ BellSouth _ Southwestern Bell _ CBI _____

Subsidiaries Not Entered

Abstract (Abstract Text, Author Signature(s), Copy to Information)

This technical memorandum (TM) discusses guidelines for high speed analog data transmission on a switched network that reflects the transmission impairments associated with today's network configurations and new high speed modem technologies.

Ricardo J. Perez
Systems Engineer
Network Transport and Synchronization